

Mountain King Gold Mine and Mill  
Madam Felix-Hudson Mining District  
4.3 Air Miles Northwest of Copperopolis  
Calaveras County  
California

HAER No. CA-77

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PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

REDUCED COPIES OF MEASURED DRAWINGS

Historic American Engineering Record  
Western Regional Office  
National Park Service  
U.S. Department of the Interior  
San Francisco, California 94102

HISTORIC AMERICAN ENGINEERING RECORD

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Mountain King Gold Mine and Mill

HAER No. CA-77

Location: Madam Felix-Hudson Mining District  
4.3 air miles northwest of Copperopolis  
Calaveras County, California

UTM: 10.702060.420870  
Quad: Salt Spring Valley, California

Dates of Construction: 1904-1905; Major alterations - 1936-1943

Engineers: J. H. Finley

Builder: Womble Brothers (Mountain King Gold Mining Co.)

Present Operator: Meridian Gold Company  
P.O. Box 190  
Copperopolis, CA 95228

Present Use: Archeological remains were almost completely removed by  
excavation for large open pit gold mine following recordation.

Significance: The Mountain King Mill was originally constructed as a stamp mill  
for processing gold ore, and was in intermittent but fairly  
continuous use from 1905-1946. It was significantly altered in a  
number of respects, being modernized and expanded for use not  
only for gold ore milling, but later for the processing of copper  
ore. This mill is significant as an example of a typical small gold  
stamp mill, similar to many others, also now gone, in the Mother  
Lode gold belt of California. It is part of the Madam Felix-  
Hudson Mining District [see HAER No. CA-76].

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The Mountain King Gold Mine and Mill is located within the relatively small Madam Felix-Hudson Mining District [see HAER No. CA-76]. The district is situated on the west belt of the California Mother Lode, some 7 or 8 miles west of the main lode. Small-scale placer mining began in the late 1850s and expanded into vein prospecting and the erection of several small mills by 1860. Nearby copper deposits received the miners' attention during the Civil War, after which several gold mining companies initiated more substantial development, culminating with the erection of the 120-stamp Royal Consolidated Mining Company's mill in 1902-03 [see HAER No. CA-81]. The small company town of Hodson rose and fell with this ambitious but shortlived venture, while several smaller mining and milling operations maintained activity in the district through World War II.

The Mountain King mine and mill are on the patented Mountain King lode claim, where original prospecting operations undoubtedly began as far back as the late 1850s. A decade later, small-scale mining appears to have been initiated and possibly a small tonnage of ore was milled nearby, likely in the ravine just southeast of the site at the mill of the Alban Ranch Mining Company.[1] No further work of substance, however, seems to have been done until the 1890s, when a shaft was sunk by the Womble brothers, reaching an inclined depth of 500 feet by 1904. In that year, stimulated by the activity of the Royal Mine nearby, the first serious attempts were made to systematically mine and mill ore from the Mountain King vein.

The Mountain King mill was erected in 1904-1905 by Clayburn and Willis Womble, to process the gold ore from the mine.[2] The shaft, aligned in a N 60 degree E direction down the dip or inclination of the vein (26-30 degrees), was collared on the north side of a low ridge. The mill was constructed on the steeper south side of this ridge, in order to take fullest advantage of gravity in the processing of the ore.[3] The headframe (gallows-frame) was built to merge with the upper part of the mill building, so that the ore could be hoisted up the shaft in skips and dumped directly into an ore bin at the top of this structure.

Water was probably first provided for the mill processing from a nearby reservoir on Clover Creek and later supplemented by water pumped from the mine. It was stored in wooden tanks and later in a reservoir constructed by damming and "gunniting" old mine workings on the crest of the ridge just west of the mill. Other facilities included the hoisting works, two compressors, a blacksmith shop, a garage, an assay office, a mine office, and a mine-owner's residence, these all being located on the north side of the ridge near the shaft (see Figure 1). In the years' operation of the mill, the tailings were just run into downslope drainages. At a later date, two tailings ponds were constructed below and south of the mill to contain the increased volume of tailings from expanded operations.

As originally constructed in 1904-1905 by the Womble brothers, the mill building measured 32-1/2 feet in width, 98 feet in length, with a maximum height of 61-1/2 feet, enclosed by board-and-batten exterior walls (see Figure 2). From the skip dump at the top of the ore bin, there was a drop of some 52-1.2 feet to the upper floor. This provided room for a jaw-crusher (generally referred to as a "rock breaker") just below the ore bin, and for a mill bin below the

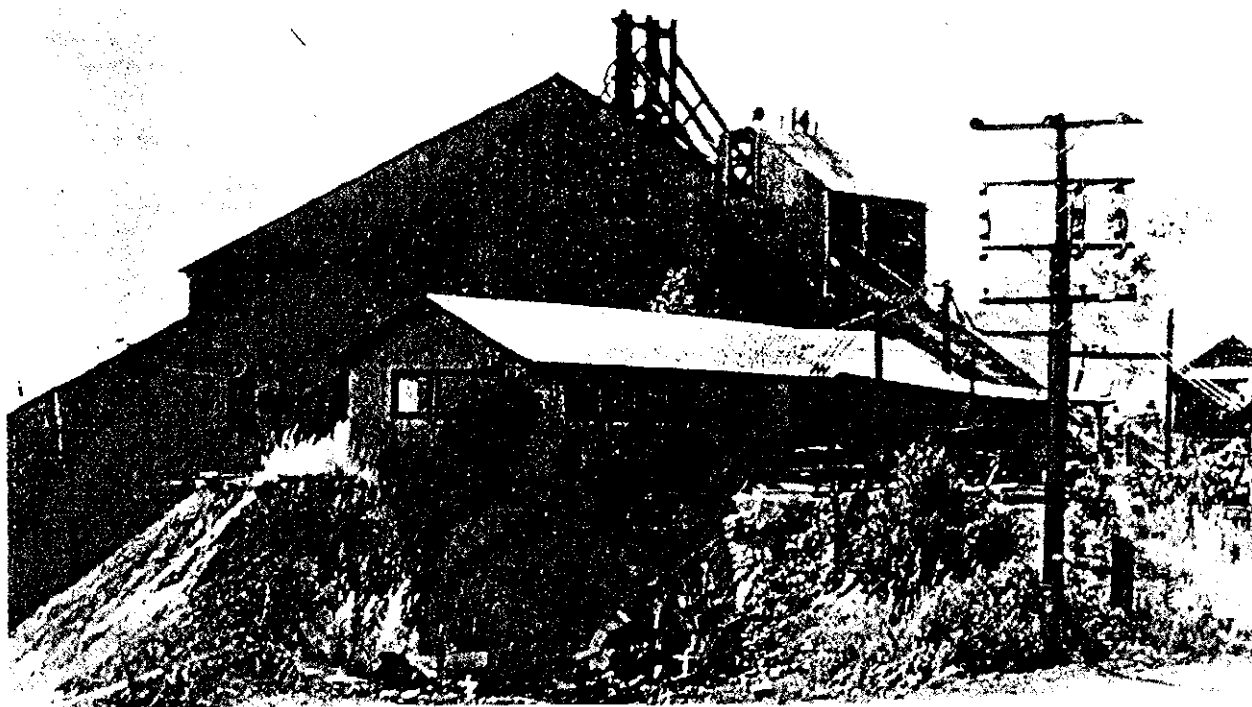


Figure 1 View of surface plant from the east, ca. 1945. Office and shops in foreground, mill and headframe in background. Courtesy of Charles Stone, Copperopolis, California.



Figure 2 Mill building from the west showing door access to table floor, 1934. Top of crushing plant visible over peak of roof. Calaveras County Historical Society (CCHS) Photo No. 2140.

crusher to hold the processed ore. At the foot of the mill bin was an automated feeder to supply crushed ore to the stamp battery. This battery was mounted on the second floor, six feet lower, on a massive wooden base with three 14x23-inch uprights measuring 16 feet 3 inches in length (see Figure 3). One mortar, bearing the name "Union Iron Works, San Francisco," has been recovered and preserved. It was apparently discarded early in the operation and replaced by a new one. The two batteries of five stamps each were separated by the middle upright (see Figure 4). The weight of the individual stamps is not known, but likely did not exceed 750 pounds. We do not know whether the mill was steam or electric powered when first constructed, but if it was by steam, it was converted to electricity at an early date. Power was transmitted from the line shaft to large wooden bull wheels on the end of the cam shafts. The speed of rotation of the cam shaft was controlled by the relative sizes of the bull wheel and the pulley wheel on the line shaft. A manual clutch was used to start and stop each set of 5 stamps.

The amalgamating equipment was on the mill floor, just south of the stamp battery. Silver-plated copper amalgamating plates were mounted at the discharge of the mortar, and on tables below, to recover the amalgam produced in the mortar. On the next floor down, some seven feet lower, one or two concentrating tables continued the process by segregating and saving the gold-bearing sulfide minerals. We do not know what kind of tables these were, other than that they were a variety of "bumping" or shaking tables. Later, they were replaced with two more effective Wilfley tables. On the next floor down, some six feet lower, two vanners completed the concentration process. These were probably either Frue or Triumph vanners. A small retorting room adjoined this floor on the south, where the amalgam was retorted and the quicksilver salvaged. The table and vanner concentrates were trammed to a small building east of the mill for storage until shipment to the smelter.[4]

In its originally-constructed form, the Mountain King mill could process only about 20-30 tons of ore per day, apparently adequate for the small underground operation envisaged by the Womble brothers. In 1909, Robert B. Parks, who owned a number of mining claims adjoining the Mountain King mine and who also had an interest in the Mountain King, took over control of the property from the Wombles. Further underground development was intermittently carried out during the period 1909-1934 by Parks and by others under leases from Parks. This work indicated that the prevailing low-grade quality of the Mountain King ore required a larger rate of tonnage to be processed by the mill to turn it into a profitable operation. Several improvements were made to the mill in the mid-1930s for this purpose. At this time, Byron E. Rowe was superintendent and Tom Blazer was serving as millwright to carry out the mill modifications.

The rate of production of the stamps could be improved only slightly, however, and this common problem was usually solved by adding more stamp batteries. In the case of the Mountain King, it was decided to convert the stamp battery to a preliminary grinder by changing to coarser mortar screens, and to add a small Marcy ball mill with rake classifier to do the final grinding of the mill pulp. The old amalgamating plates were removed to make room

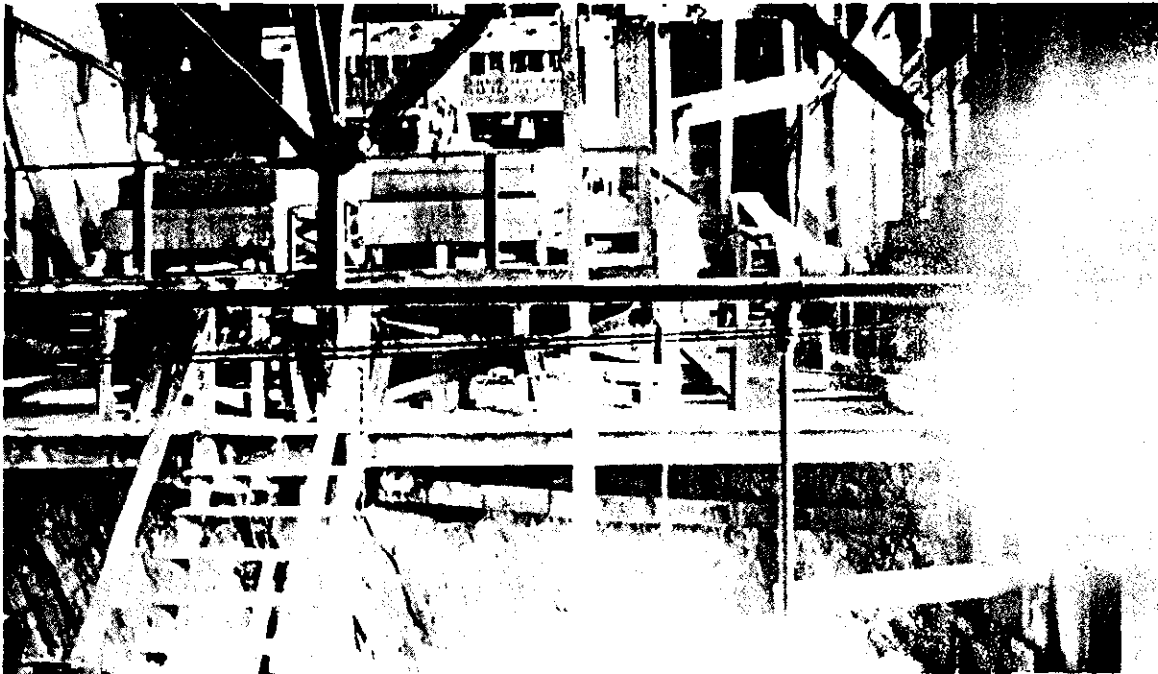


Figure 3 Interior of mill, 1934. View of milling floor from the south; two batteries of 5 stamps each in background with amalgamating tables in front. CCHS Photo No. 2144.

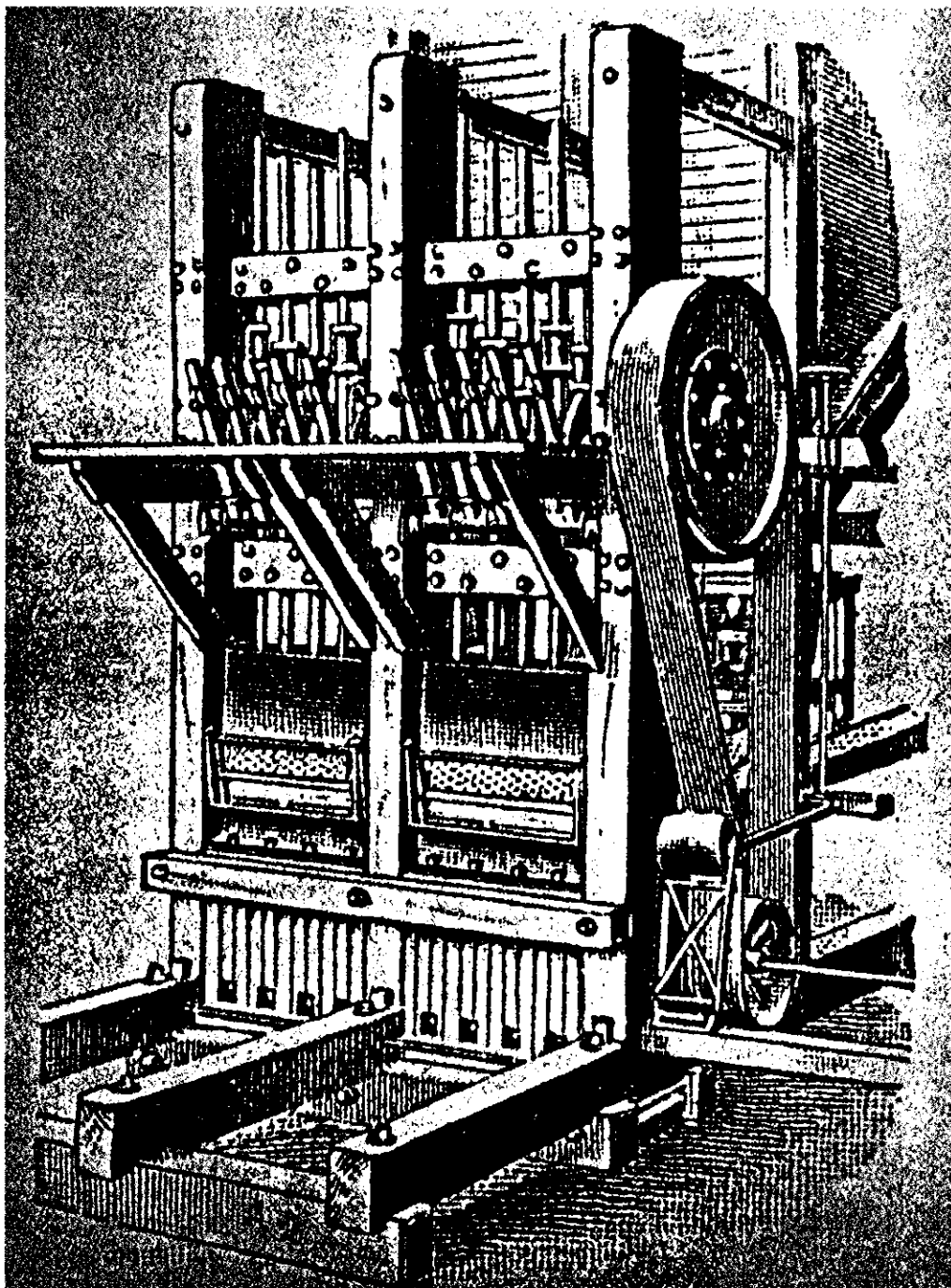


Figure 4 Typical ten-stamp battery. Allis Engineering Company's advertising picture of a model used similar to that installed in the Mountain King mill. (Rickard 1897)



for the March mill, and a jig was added to the process, just below the ball mill discharge to recover free gold.

At this time, the old board-and-batten exterior of the mill was torn down, better foundations poured under the structural members of the mill building, and concrete footings made to replace the old wooden base under the stamp battery. Concrete bulkheads were also installed between the various decks or mill floors. The mine and mill operation had to be suspended while this work was being done.[5]

In 1937, the Jumbo Consolidated Mining Company took over the Mountain King operation from Parks, continuing Byron Rowe as superintendent for the new operations. Additional claims, owned by the McCarty family, were also optioned by Jumbo. Substantial further improvements were then made to the mill. The headframe was rebuilt and a larger ore bin added. The old crusher was removed, and a new crushing plant built, with a Sullivan primary (jaw) crusher, a secondary Taylor cone crusher, and an elevator to run the crushed ore into new and larger mill bins. A screening operation was included in order to increase the crushing capacity, by allowing the fines to bypass the secondary crusher. The old stamp battery was bypassed and a new, larger Hendy ball mill was added, requiring an extension to the west side of the mill building. This ball mill was equipped with a Door rake classifier and a double-diaphragm Wilfley jig, installed by Western Knapp Engineering Company. After leaving the ball mills, the pulp was run into a large cone to separate the sands from the slimes (fines).

The coarse product (sands) from the mills was run over the tables. A flotation circuit was also added for processing the slimes, being installed on a platform or mezzanine deck over the old vanners. The flotation concentrates (gold-bearing sulfides) were recovered by the use of a large filter (Bagley type) mounted on the flotation deck. The vanners had been removed, as the tables and the flotation circuit made them unnecessary to the process. The vanner floor space was now used for the cone classifier, pumps for the flotation circuit, and for handling the concentrates from the jigs, tables and flotation. A new concentrate bin was constructed just below the mill building, and from this bin, trucks could be loaded for taking the concentrates to the smelter. The retort room still served its purpose in reclaiming the free gold from the amalgam. The Mountain King mill was now able to handle between 200 to 250 tons of gold ore a day. The inclined shaft had reached a length of 1,200 feet, with extensive underground workings.

The Jumbo Consolidated Mining Company, a Nevada corporation, had financial problems, and a new company, El Gabilan Corporation, was formed in 1941 by the principal stockholders to continue the operation. Mr. J. W. Shaw, former president of Jumbo, served as president of the new company, and Byron Rowe continued as superintendent. Anthony Dutil, who had worked at the mill much of the time since the middle 1930s, became mill foreman. The El Gabilan operation was shut down in 1942, as were most gold mining concerns, because of the war. El Gabilan also had serious management problems. The physical assets had been purchased by the Stewart and Nuss Company of Fresno, California, in 1942 with the idea of starting an open-

pit gold mine at the Mountain King. However, they were offered a contract from the Keystone Copper Company to haul the copper ore from the North Keystone Mine at Copperopolis, about 4 miles away, and to process it at the Mountain King mill. Accordingly, Stewart and Nuss converted the mill over to the processing of the copper ore. An ore pass, with a grizzly, was constructed just northeast of the hoisting works where trucks could dump the Keystone ore directly into the ore pass. From here, it was hauled up by ore skip to the ore bin and the crushing plant at the top of the mill building. A hand-sorting belt was installed before the Sullivan crusher and the ore was upgraded by hand-picking waste pieces off the belt. Also a large Marcy ball mill was added and installed with a rake classifier in an extension of the mill building to the east of the milling floor.[6]

In 1943, the Keystone Copper Corporation, managed by Otto Schiffner of Grass Valley, California, took over the mill operation from Stewart and Nuss. They built a new crushing and sorting plant east of the mill, where trucks could dump the ore from the Keystone mine at Cooperopolis directly into the crusher. The crushed ore was run over a sorting belt and then into an ore pass over the shaft. The flotation plant was enlarged, and it was reported that up to 700 tons of copper ore could be processed a day, although it was officially rated at only 250 tons a day. In 1944, nearly 100,000 tons of ore went through the mill. Over 250,000 tons of copper ore had been milled when this operation was terminated in 1945.[7]

At the conclusion of World War II, the Mountain King mill was converted back to gold ore treatment. The increased capacity allowed Stewart and Nuss, under the management of Harry E. Bush, former superintendent of the North Keystone mine, to open-pit mine and process low-grade ore from the Hobo pit, located a short distance southeast of the Mountain King mill, and the Hill Top pit, farther east. Improvements in the mill, at this time, included the addition of a bank of Knudsen bowls, installed in a deck over the old vanner floor, to improve the recovery of fine particles of free gold and fine sulfides in the sands. The open pit operation was carried on for about 2-1/2 years. Constantly increasing costs of labor and materials, with a fixed price of gold, then forced the closure of the Mountain King in 1948. Total production of gold from the Mountain King mine at that time probably amounted to about 35,000 ounces.[8]

The last use of the mill was made in 1953, in an attempt to mill asbestos ore trucked in from Tuolumne County. However, this facility was not adaptable for such a use. Subsequently, the equipment was salvaged or scrapped, and the building razed. Features extant during the 1988-1989 HAER recording included the concrete foundations of the mill building and those for some of the mill equipment [see HAER Photograph No. CA-77-1 and CA-77-2], the hilltop reservoir and tailings pond, some of the auxiliary building foundations, the hoisting works [see HAER Photograph No. CA-77-3], the shaft collar, and much of the mine waste dumps. The Mountain King gold mill site has now been completely removed by modern surface mining operations.

- [1] Brief mentions of the Alban Ranch Mining Company, and of its principal, Joseph C. Duncan, appeared in Copperopolis Courier (April 1865 to September 1867; microfilm file at California State Library, Sacramento).
- [2] Information on the Womble brothers sinking the shaft and building the mill is principally from contemporary items in the Mining and Scientific Press and in the Engineering and Mining Journal (card index references on file at library of California Division of Mines and Geology, Pleasanton, California).
- [3] Field Notebook of surveyor J. H. Finley, \* dates, Calaveras County Surveyor's Office, San Andreas, California.
- [4] Brief details of this original mill are in sources in Notes 2 and 3 above; most of the description is based on interviews with Anthony Dutil who worked at the Mountain King in the mid-1930s, when the mill was still in much of its original condition, and continued working at the mill during its rebuilding in the late 1930s. (Anthony Dutil, Royal Mountain King Mine Historic Sites Mitigation Program: Catalogue of Interviews and Oral Histories, compiled and edited by Judith Marvin and Willard P. Fuller, Jr., 1991).
- [5] Dutil interviews, see note 4 above.
- [6] William B. Clark, Mines and Mineral Resources of Calaveras County, County Report 2, California Division of Mines and Geology, 1963, pp. 64-65, 169. Unpublished manuscript by Ella M. Hiatt, "The Mountain King Mine," Madam Felix-Hodson file, Calaveras County Historical Society, San Andreas, California.
- [7] Information on copper-ore processing and ore tonnages from the annual volumes of Minerals Yearbook (U.S. Bureau of Mines) for pertinent years.
- [8] Notes from interviews conducted by W. P. Fuller, Jr., with Charles Stewart and Harry Bush, early 1960s (Madam Felix-Hodson file, Calaveras County Historical Society, San Andreas).

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